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9 Wadham Gardens, London, NW3 3DN

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 13693-26

Revision: F1

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1.0 NON-TECHNICAL SUMMARY

1.1 CampbellReith was instructed by London Borough of Camden, (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for 9 Wadham Gardens, London NW3 3DN (planning reference 2021/4580/P). The basement is considered to fall within Category B as defined by the Terms of Reference.

1.2 The Audit reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development in accordance with LBC's policies and technical procedures.

1.3 CampbellReith was able to access LBC's Planning Portal and gain access to the latest revision of submitted documentation and reviewed it against an agreed audit check list.

1.4 The Basement Impact Assessment (BIA) has been carried out by engineering consultants Geotechnical & Environmental Associates (GEA) and the individuals concerned in its production have suitable qualifications as per CPG: Basements 2021.

1.5 The BIA has confirmed that the proposed basement will be founded within the London Clay.

1.6 A lost river is present in close proximity to the site but it is accepted that the proposed development will not impact nor be impacted by groundwater flow.

1.7 The proposed development is not subject to flooding.

1.8 Drawings within the revised submissions confirm that there will be a very slight increase in impermeable site area due to the proposed development which has been assessed to have a negligible impact on surface water flow.

1.9 The basement will be constructed using techniques of reinforced concrete underpinning and a contiguous pile wall in the north east section around the proposed swimming pool.

1.10 Outline structural drawings are provided indicating proposed temporary and permanent works.

1.11 A ground movement assessment (GMA) has been undertaken to determine impacts to neighbouring properties and an historic railway tunnel. A maximum of Category 1 (Very Slight) damage in accordance with the Burland Scale is predicted.

1.12 The GMA adopts a modification of the methodology presented within industry standard guidance, which requires a robust monitoring scheme to ensure construction is controlled and movements limited to within the predicted thresholds. Whilst the outline structural scheme and related movement limits are considered to be feasible, it is recommended that a BCP is provided to include a detailed temporary works and monitoring scheme, including appropriate contingency actions.

1.13 Asset protection criteria should be agreed with the tunnel owners.

1.14 It is accepted that there are no impacts to slope stability.

1.15 Considering the additional information presented it can be confirmed that the BIA complies with the requirements of CPG: Basements, subject to the recommended BCP being presented.

2.0 INTRODUCTION

2.1 CampbellReith was instructed by London Borough of Camden (LBC) on 24th November 2021 to carry out a Category B audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 9 Wadham Gardens, London NW3 3DN and planning reference 2021/4580/P.

2.2 The audit was carried out in accordance with the Terms of Reference set by LBC. It reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development.

2.3 A BIA is required for all planning applications with basements in Camden in general accordance with policies and technical procedures contained within:

- Camden Local Plan 2017 - Policy A5 Basements.
- Camden Planning Guidance (CPG): Basements. January 2021.
- Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.

2.4 The BIA should demonstrate that schemes:

- maintain the structural stability of the building and neighbouring properties;
- avoid adversely affecting drainage and run off or causing other damage to the water environment;
- avoid cumulative impacts upon structural stability or the water environment in the local area;
- and evaluate the impacts of the proposed basement considering the issues of hydrology, hydrogeology and land stability via the process described by the GSD and to make recommendations for the detailed design.

2.5 LBC's Audit Instruction described the planning proposal as "New basement extension under the footprint of the existing property and associated internal modification to the layout of the property".
The Audit Instruction confirmed 9 Wadham Gardens did not involve, nor was a neighbour to, any listed buildings.

2.6 CampbellReith accessed LBC's Planning Portal on 2nd December 2021 and gained access to the following relevant documents for audit purposes:

- Ground Investigation & Basement Impact Assessment (BIA) by GEA, Revision 2, dated 17th September 2021.
- Basement Impact Assessment Plans and Elevations by Michael Alexander, Revision P3, dated May 2021.
- Existing and Proposed Architectural Plans by Wolff Architects, Revision 0, undated.
- Design & Access Statement by Wolff Architects, Revision 0, 1st September 2021.
- Planning Consultation Responses.

2.7 CampbellReith received the following documents for audit purposes between February and August 2022:

- Ground Investigation & Basement Impact Assessment (BIA) by GEA, Revision 3, dated June 2022. With XDisp and PDisp inputs and outputs.
- Ground Investigation & Basement Impact Assessment (BIA) by GEA, Revision 4, dated 8th August 2022. With XDisp and PDisp inputs and outputs.
- Basement Impact Assessment Plans and Elevations by Michael Alexander, Revision P5, dated June 2022.
- Existing and Proposed Architectural Plans by Wolff Architects, Revision A, February 2022.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	Section 1.3.2 of BIA
Is data required by Cl.233 of the GSD presented?	Yes	
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	
Are suitable plan/maps included?	Yes	
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Section 3.1.2 of BIA
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Section 3.1.1 of BIA
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Section 3.1.3 of BIA.
Is a conceptual model presented?	No	A ground model is described and outline structural drawings provided.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	Summarised in Section 4.1

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Summarised in Section 4.1
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Is factual ground investigation data provided?	Yes	Section 5.0 of BIA
Is monitoring data presented?	Yes	Section 5.3 of BIA
Is the ground investigation informed by a desk study?	Yes	Section 2.0 of BIA
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	No adjacent basements other than the car lift / garage to No.11 Wadham Gardens.
Is a geotechnical interpretation presented?	Yes	Section 8.0 of BIA
Does the geotechnical interpretation include information on retaining wall design?	Yes	Section 8.1.1 of BIA
Are reports on other investigations required by screening and scoping presented?	N/A	
Are the baseline conditions described, based on the GSD	Yes	Clarification of pile depths provided
Do the base line conditions consider adjacent or nearby basements?	Yes	Assumptions made that are considered conservative for GMA.
Is an Impact Assessment provided?	Yes	Section 12 of BIA

Item	Yes/No/NA	Comment
Are estimates of ground movement and structural impact presented?	Yes	Section 9, 10 and 11 of BIA
Is the Impact Assessment appropriate to the matters identified by screening and scoping?	Yes	Section 12 Of BIA
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	Impermeable site area is clarified. Structural information to be confirmed as part of BCP.
Has the need for monitoring during construction been considered?	Yes	Section 11.3 of BIA. However, further detail may be required, pending review of GMA.
Have the residual (after mitigation) impacts been clearly identified?	Yes	Impermeable site area is clarified. Structural information to be confirmed as part of BCP.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	Structural information to be confirmed as part of BCP.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	Structural stability to be confirmed as part of a BCP.
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	Section 11 of BIA; GMA conclusions considered feasible, subject to BCP.
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

4.1 The Basement Impact Assessment (BIA) has been carried out by engineering consultants Geotechnical & Environmental Associates (GEA) and the individuals concerned in its production have suitable qualifications as per CPG: Basements 2021.

4.2 The LBC Instruction to proceed with the audit identified that the basement proposal did not involve a listed building nor was it adjacent to listed buildings. The Design & Access Statement identified that 9 Wadham Gardens is located in the Elsworthy Conservation Area.

4.3 The proposed basement consists of a single storey construction beneath the full footprint of the existing building formed to a formation level of 4.10m below ground level (bgl) and includes a swimming pool towards the rear of the house with a formation level of 6.30m bgl. The single storey basement is formed by means of reinforced concrete underpinning and reinforced concrete slabs. The rear wall of the basement around the proposed swimming pool is formed by contiguous bored pile walls. Tension piles maybe utilised beneath the swimming pool slab.

4.4 Outline structural drawings are provided indicating proposed temporary and permanent works. The revised submissions confirm that: the underpinning will be undertaken in a single lift; the length of piles has been adopted to reduce loading on the nearby tunnel lining; the temporary and permanent works will be sequenced such that stiff propping will be applied at all times to the retaining walls.

4.5 The Ground Investigation carried out included a percussion borehole to a depth of 30.00m bgl. The Ground comprises of Made Ground to c.0.70m and underlain by London Clay to depth. Groundwater was not encountered during the investigation and subsequent monitoring indicates water to be at shallow depths of c.0.40m bgl. Given the cohesive nature of the strata, the BIA considers this to be representative of localised perched water.

4.6 The screening and scoping assessments for hydrogeology and land stability state that the site is close to a lost river. The lost river is located approximately 70m west of the site and, as the London Clay is classified as unproductive strata, will not impact or be impacted by the proposed basement.

4.7 The hydrogeology screening assessment identifies an increase in hard surfaced areas at the proposed front lightwell. Questions 3 and 4 of the hydrology screening assessment acknowledge that there will be a slight increase in hardstanding. This is confirmed by drawings submitted in the revised submissions. The Scoping exercise, indicates there will be a slight increase in hardstanding with negligible impact on surface water flow.

4.8 The presence of a Network Rail tunnel beneath the rear garden, an increase in differential depths of neighbouring foundations, shrink swell of London Clay, and the site's proximity to an existing highway are all identified by the Land Stability screening. The scoping determines the need for a Ground Movement Assessment (GMA) of the tunnel and adjacent properties. The GI confirmed there was no evidence of desiccation in the shallow soils.

4.9 The following sensitive structures are noted in the vicinity of the excavations:

- No. 11 Wadham Gardens, assumed to have shallow foundations.

- No. 7 Wadham Gardens has no existing basements (from a search of planning applications) and is assumed to have foundations to a depth of c.0.80m, similar to the existing building.

4.10 The Network Rail owned Primrose Hill Tunnel is present beneath the rear garden of the site and the proposed works is assumed to be c.3.00m to the outer tunnel wall and c.7.40m to the crown of tunnel.

4.11 It's noted that the BIA identifies a basement car lift present in the driveway of No.11 Wadham Gardens to a depth of c.4.00m bgl, which it does not consider to be a sensitive structure due to the similar depth of foundations to the proposed basement.

4.12 The geotechnical parameters to be adopted in the basement design and ground movement calculations are presented in the BIA. The Young's Modulus values for the London Clay have been calculated using a multiple of 500 times the cu respectively. This correlation is considered to meet the requirements of the BIA to use cautious or moderately conservative engineering values and is therefore comparable to a basement development in London Clay.

4.13 A GMA and damage assessment are provided in Section 10.0 and 11.0 of the BIA, respectively, to demonstrate that ground movements and consequential damage to neighbouring properties will be within the LBC's policy requirements. PDisp software has been used to model vertical movements based on anticipated changes in vertical loading. Ground movements due to underpinning, piling and excavation have been modelled using X-Disp software.

4.14 Three stages of models are produced within PDisp and XDisp. Stage 1 considers undrained parameters with structural loading (piling and underpinning) only. Stage 2 considers undrained parameters with structural loading and heave. Stage 3 considers drained parameters with structural loading and heave accounted for.

4.15 The GMA indicates a maximum of Category 1 (Very Slight) damage will be sustained by neighbouring properties. A number of iterations of the GMA have been presented, with the final submissions accepted as predicting a range of movements that are feasible with close control of the construction process, requiring a robust monitoring scheme to ensure construction is controlled and movements limited to within the predicted thresholds

4.16 The Xdisp assessment adopts ground movement curves from CIRIA 760 for the underpin installations and, based on a paper by Langdon. et.al (2014), factored CIRIA 760 curves are considered for the bored pile wall installation. The length of the piles is confirmed to be 20m deep (as 4.4, in order to reduce loading on the tunnel lining).

4.17 Whilst the outline structural scheme and related movement limits are considered to be feasible, it is recommended that a BCP is provided to include a detailed temporary works and monitoring scheme, including appropriate contingency actions.

4.18 A separate analysis is performed for the Network Rail tunnel. This audit addresses the GMA for neighbouring buildings only and Network Rail may require separate assessment to satisfy their requirements and agree asset protection criteria.

4.19 It is accepted that there are no slope stability concerns regarding the proposed development and it is not in an area prone to flooding.

5.0 CONCLUSIONS

5.1 The BIA has been carried out by individuals who possess suitable qualifications as per CPG: Basements 2021.

5.2 The BIA has confirmed that the proposed basement will be founded within the London Clay.

5.3 A lost river is present in close proximity to the site but it is accepted that the proposed development will not impact nor be impacted by groundwater flow.

5.4 There will be a very slight increase in impermeable site area due to the proposed development which has been assessed to have a negligible impact on surface water flow.

5.5 The proposed development is not subject to flooding.

5.6 Outline structural drawings are provided indicating proposed temporary and permanent works.

5.7 A ground movement assessment (GMA) has been undertaken and results indicate a maximum of Category 1 damage being sustained by neighbouring buildings. Whilst the outline structural scheme and related movement limits are considered to be feasible, it is recommended that a BCP is provided to include a detailed temporary works and monitoring scheme, including appropriate contingency actions.

5.8 If required, appropriate asset protection criteria should be agreed with the tunnel owners.

5.9 It is accepted that there are no impacts to slope stability.

5.10 Considering the additional information presented it can be confirmed that the BIA complies with the requirements of CPG: Basements, subject to the recommended BCP being presented.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
J Prooth	Unknown	07/11/2021	Structural damage to neighbouring properties.	A Basement Construction Plan is requested detailing the temporary works scheme and comprehensive structural monitoring strategy, to ensure damage is limited within Category 1.
Mr. P Land	7 Wadham gardens	03/12/2021	Structural damage to neighbouring properties.	A Basement Construction Plan is requested detailing the temporary works scheme and comprehensive structural monitoring strategy, to ensure damage is limited within Category 1.

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Hydrology	Changes to impermeable site area to be clarified. Mitigation measures to be presented, if required (e.g. outline drainage strategy).	Closed	August 2022
2	Land Stability	Geotechnical parameters to be reviewed and sensitivity analysis presented (noting stiffness values will influence PDisp assessment within GMA).	Closed	July 2022
3	Land Stability	Additional structural information to clarify the proposed scheme sufficient to demonstrate stability will be maintained and has been appropriately considered in the GMA (e.g. pile lengths, sequencing and propping arrangements, monitoring proposals).	Closed; BCP recommended.	August 2022
4	Land Stability	GMA to be updated to be consistent with clarifications to geotechnical parameters and structural information, and to demonstrate reasonably conservative values have been adopted (e.g. consider stages of movement, provide full calculation pack, etc.).	Closed; BCP recommended.	August 2022

Appendix 3: Supplementary Supporting Documents

None

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